

AD-A122 371

COMPARISON OF THE MARGINAL COST-EFFECTIVENESS OF
VARIOUS RECRUITING RESOU. (U) DUKE UNIV DURHAM NC
CENTER FOR APPLIED BUSINESS RESEARCH R C MOREY NOV 82
200-7-ONR N00014-80-C-0200 F/G 5/9

1/1

UNCLASSIFIED

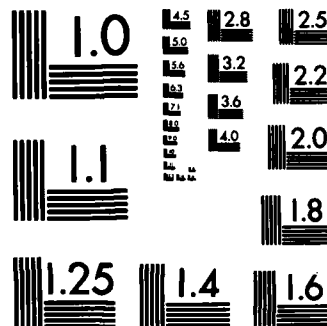
NL

END

FILMED

111

DFC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

AD A 122371

DUKE

THE FUQUA
SCHOOL
OF BUSINESS

CENTER FOR APPLIED BUSINESS RESEARCH

COMPARISON OF THE MARGINAL COST-EFFECTIVENESS OF VARIOUS RECRUITING
RESOURCES FOR HIGH SCHOOL GRADUATE ENLISTMENTS:

Analyses of National, Local and "Walk-In" Leads and Yield Rates

Contract N00014-80-C-0200

Report ONR-200-7

Principal Investigator: Richard C. Morey, Ph.D.

November, 1982

DEC 15 1982

E

This document has been approved
for public release and sale; its
distribution is unlimited.

82 12 15 093

FILE COPY

A Technical Report Prepared for the Navy Recruiting Command
and the Office of Naval Research

Contract N00014-80-C-0200

Report ONR-200-7

COMPARISON OF THE MARGINAL COST-EFFECTIVENESS OF VARIOUS RECRUITING
RESOURCES FOR HIGH SCHOOL GRADUATE ENLISTMENTS:
Analyses of National, Local and "Walk-In" Leads and Yield Rates

November, 1982

Principal Investigator: Richard C. Morey, Ph.D.

Associates: John M. McCann, Ph.D., Varsha P. Rao, M.A.

THE CENTER FOR APPLIED BUSINESS RESEARCH
FUQUA SCHOOL OF BUSINESS
DUKE UNIVERSITY
DURHAM, NORTH CAROLINA
(919-684-2012)



Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Distribution/or	
DTIC	
A	

TABLE OF CONTENTS

	<u>Page Number</u>
1.0 INTRODUCTION	1
2.0 SUMMARY OF COSTS AND PERFORMANCE MEASURES FOR FY80	3
2.1 National Advertising and NOIC Leads	3
2.2 Local Advertising (LAMS) and Local Leads	4
2.3 Recruiters and HSG Contracts	4
2.4 Mix of Recruiting Efforts and Advertising	5
3.0 ANALYSIS OF LOCAL LEADS	5
3.1 Data Limitations	5
3.2 Results and Interpretation	6
4.0 ANALYSIS OF NOIC LEADS	8
5.0 ANALYSIS OF PRODUCTION OF HSG ENLISTMENT CONTRACTS	12
5.1 Structure of Model	12
5.2 Results for HSG Contracts	13
5.2.1 Impact of NOIC Leads	13
5.2.2 Impact of Local Leads	15
5.2.3 Impact of Recruiters	15
5.2.4 Direct Impact of Advertising on HSG Contracts Over and Above Impact on Leads: Impact of Advertising on "Walk-In's"	16
5.2.5 Impacts on Demographics	16
6.0 SUMMARY OF MARGINAL COST-EFFECTIVENESS OF VARIOUS RESOURCES ON HSG CONTRACTS IN FY80	17
7.0 COMPARISON OF RELATIVE IMPORTANCES OF VARIOUS TYPES OF LEADS, ADVERTISING EXPENDITURES, RECRUITERS, AND DEMOGRAPHICS ON TWO TYPES OF QUALITY CONTRACTS	19

1.0 INTRODUCTION

Previous regression studies by this investigator for the time period FY76-78 (see "The Impacts of Various Types of Advertising Media, Demographics and Recruiters on Quality Enlistments: Results from Simultaneous and Heteroscedastic Models," R.C. Morey, Office of Naval Research Report, July, 1980) had concluded that local advertising in the classified ads and high school newspapers (i.e., LAMS) appeared to be a very cost-effective mechanism for improving the yield of male, non-prior service High School graduate (HSG) contracts. It was also clear that many quality contracts are not the result of either a NOIC (National) lead or even a local lead,^{*} but are the result of what we may term a "walk-in" lead, i.e., a potential recruit decides to visit his local recruiting station directly, rather than first becoming a NOIC or a Local Lead. Indeed as will be seen the yield rates for both NOIC and local leads to HSG contracts are relatively low, i.e., of the order of a few percent.^{**}

In order to be able to separate out the many confounding effects, this research focused on the data for FY80, the only year for which local leads were available. Pooled time series, cross-sectional regression techniques were used to explore for the first time such key issues as the elasticity of LAMS advertising on local leads, and the elasticities of local leads and national leads on HSG contracts. In addition, we have attempted to estimate which media types appear to have the largest impact on "walk-in's" i.e., the impact of various types of advertising over and above its effect in generating national and local leads.

The key conclusions are that, in FY80, if additional HSG contracts had been needed, the ranking of the most cost-effective mechanisms would have

^{*} A local lead, in the Navy Recruiting Command's jargon, is a lead which is in direct response to a locally placed classified ad (roughly 40% of these ads are "blind" i.e., there is no reference to the Navy or the Department of Defense as the prospective employer).

^{**} The Navy estimates that about 3.7% of all NOIC leads convert to some type of contract and that 4.4% of all local leads in FY81 convert to a contract. However, they don't know the types of contracts involved. We shall be interested in the yields in terms of quality contracts.

been the following:

- 1) Navy GEP - General Magazines (this result is due in part to the extremely low level^{*} of funds expended for this media in FY80, and the fact that Navy GEP - magazines may generate both national and "walk-in" leads. It is difficult to estimate a realistic marginal cost here because of the very small level of Navy magazine advertising in 1980.
- 2) Navy GEP - General Direct Mail; the marginal cost here is estimated to be about \$960^{**} (with advertising overhead included). Only \$431K was spent on this media in FY80, compared with \$3.4M on TV and Radio.
- 3) JADOR magazines; the marginal cost here for additional Navy contracts is \$1250^{**} (with overhead included) and is due to the fact that JADOR - magazines, in addition to its positive effect on NOIC leads, appears to create "walk-in" leads for the Navy. The fact that JADOR magazines also may well produce leads and contracts for the other services as well renders it very cost effective.
- 4) Navy LAMS advertising; the marginal cost here is \$2,170 (with overhead included).
- 5) Recruiters; the marginal cost here is about \$4,400 and could be even more, based on the assumed yearly cost of a recruiter and his support (this figure assumes an annual cost of \$26,000).
- 6) Navy TV/Radio (GEP - General).
- 7) Navy's GEP - Minority.
- 8) JADOR TV/Radio.
- 9) JADOR Direct Mail.

^{*}The total yearly expenditures for magazines (General Enlisted Program - General) was less than \$40,000 in FY80. The estimate of magazine's impact on NOIC Leads was based on FY79 and FY80, and hence has some validity.

^{**}All dollars are in FY80 dollars.

Options (6), (7), (8) and (9) do not appear to be cost effective options by themselves for increasing the yield of HSG Contracts.

In addition, the yield rate for all NOIC Leads, in terms of HSG Contracts, is about 2.3 % whereas the yield rate of Local Leads, relative to HSG Contracts, is about 1.53%. That is, it takes about 43 NOIC Leads or 65 Local Leads to generate 1 additional HSG Contract at the margin. Given that each Local Lead costs about \$30 and each NOIC - Navy Lead about \$80, it appears Local Leads are more cost effective mechanisms for increasing the numbers of HSG Contracts, given the present mix of Navy's national advertising. In addition, the estimated marginal cost of each Local Lead is \$34 (including overhead) whereas the lowest marginal cost for additional NOIC - Navy source leads is about \$44 (from more Navy direct mail), including overhead. Hence, depending on the type of Navy's national advertising utilized, NOIC - Navy source leads may be very competitive with Local Leads in terms of their yield for HSG Contracts.

The remainder of the report is organized as follows: Section 2 provides a summary of the key outcomes for FY80 and provides some insightful averages; Section 3 deals with an analysis of Local Leads and Section 4 the analysis of national leads. An interesting result is that LAMS advertising has almost a linear effect on Local Leads, i.e., it does not appear to experience very much in the way of diminishing returns.* Section 5 investigates the impacts of different types of leads on the production of HSG Contracts. Section 6 integrates the results of Sections 3, 4 and 5 to yield the overall cost-effectiveness of various types of resources in terms of male, non-prior service HSG Contracts. Finally, Section 7 provides some tentative qualitative remarks for HSG Contracts compared with Upper Mental, HSDG Contracts.

2.0 SUMMARY OF COSTS AND PERFORMANCE MEASURES FOR FY80

2.1 National Advertising and NOIC Leads

The advertising placement expenditures in FY80 can be summarized as follows:

The other recruiting resources experience much higher marginal costs for each additional lead or contract, due to the shrinking eligibility pool.

For the General Enlisted Program - General, the total* was about \$3.854 million broken down as follows:

- i) \$1.267 Million for TV
- ii) \$2.121 Million for Radio
- iii) \$0.0375 Million for Magazines
- iv) \$0.431 Million for Direct Mail

The GEP - Minority expenditures totaled \$.562 Million. The total of JADOR expenditures was \$7.793 Million, broken down as \$3.364 Million for JADOR TV, \$.926 Million for JADOR Radio, \$2.167 Million for JADOR Magazines, \$.976 Million for JADOR Direct Mail and \$.359 Million for JADOR supplements.

These advertising resources produced 144,477 unduplicated NOIC Leads of which 74,768 were due to JADOR sources. Hence there were 69,709 NOIC Leads from Navy advertising. When one adds in the overhead cost (copy cost, profit, etc.) for Navy national advertising at approximately 26%, then one arrives at an average NOIC Lead (Navy source) cost of about \$80 (i.e., cost of all Navy national advertising \times 1.26/69,709 = \$80).

2.2 Local Advertising (LAMS) and Local Leads

The placement costs for LAMS (classified ads in local newspapers and advertising in high school newspapers) totaled \$1.207 Million and generated a reported total of 55,645 Local Leads in FY80. (This number may well be an underestimate since FY80 was the first year in which Local Leads were tracked and hence there may well have been some underreporting.) When overhead cost at the rate of 38% are added in, this yields \$30 as the average cost per Local Lead. The true average is most likely less since the number of Local Leads is probably underestimated, perhaps as much by a factor of two.

2.3 Recruiters and HSG Contracts

In FY80, there were a total of 3,755 production recruiter man-years.

*This includes placement costs only.

expended. This equates to a range of from \$97.63 Million to \$123.92 Million, depending on a recruiter man-year cost (with support) of either \$26,000 or \$33,000.

In FY80, there were a total of 63,929 male, non-prior service HSG Contracts obtained. There were also 58,502 male, non-prior High School Degree Contracts (HSDG, excluding HSG's with GED's) and 38,680 Upper Mental (Mental Category 1-III A) male, HSDG Contracts. This equates on the average to about 17.025 HSG Contracts per year per recruiter, 15.58 HSDG Contracts/year per recruiter and 10.3 Upper Mental, HSDG Contracts per recruiter man-year.

2.4 Mix of Recruiting Efforts and Advertising

If one does not count the JADOR expenditures and uses \$31,000 as the average cost of a recruiter and his support (including RAD costs), the percent of the total budget allocated to recruiters and their support is about 94%. (This includes the overhead on the advertising costs.) The calculation is:

$$\frac{\$116.41\text{M (recruiter cost)}}{\$116.41\text{M (recruiter costs)} + \$1.207\text{M (1.38) (LAMS cost plus overhead)} + \$4.419\text{M (1.26) (GEP costs plus overhead)}} = \frac{116.41}{123.355} = .9437$$

3.0 ANALYSIS OF LOCAL LEADS

3.1 Data Limitations

A tentative analysis of the impact of LAMS advertising on Local Leads was performed using only one year of data (i.e., for FY80). Local Leads are the result of ads in the classified section of local newspapers and high school newspapers and very often (about 40%) do not mention the Navy or DOD as the prospective employer. This is the first year data on Local Leads was available and is of questionable value since it is not known if all districts reported all of these types of leads. One estimate* is that perhaps

* Private communication with Ms. Diane Edwards of Navy Recruiting Command's Advertising Section.

only one-half of the true Local Leads were being reported. In addition, the key resource variable, i.e., level of LAMS expenditures by district, was only available on a quarterly basis.

3.2 Results and Interpretation

The results of a pooled, cross-sectional log-log, regression (across 43 districts for 4 quarters in FY80) are shown in Table 1. The Park's regression package, which is one of the most sensitive of the regression packages available, was utilized. Quarterly dummy variables were included. The only statistically significant variable (at the 10% level) was LAMS Advertising with an elasticity of .889. This is to be interpreted that a 10% increase in LAMS Advertising in FY80 would be associated with a 8.89% increase in Local Leads. The marginal cost for each additional Local Lead is then \$34, including overhead at 38%.

The other variables appear to have the right sign (i.e., the local unemployment rate at 1.409, percent black at .057, size of labor force at .11 and urban-rural mix at -.0818) but are not statistically significant, probably due to the relatively small sample size and the lack of much real variation in the independent variables. However it does confirm the intuitive fact that LAMS advertising does impact the level of Local Leads and that there appears to be very little of a diminishing return nature associated with this resource.

It is of interest to point out in this section that there seems to be on the average about a one-month lag in the yield of Local Leads to HSG Contracts or for Upper Mental HSDG Contracts. We stress this is different from a conversion rate since many of the Local Leads are not even candidates for a HSG Contract or an Upper Mental HSDG Contracts and that the elasticity of Local Leads on HSG Contracts is .0133. This equates to a yield rate from Local Leads of 1.53% for HSG Contracts. When one looks at the FY80 expenditures, one has a reported total of 55,645 Local Leads in return for \$1.207M

TABLE 1

THE IMPACTS OF LOCAL ADVERTISING (LAMS) EXPENDITURES
AND KEY DEMOGRAPHICS ON LOCAL LEADS

(Based on Pooled* Quarterly-District Observations for FY80, i.e., 172 Cells)

<u>Variable</u>	<u>Elasticity Estimate</u>
0) Number of Local Leads Obtained in a District for Quarter (de- pendent variable)	-
1) Average Local General Unemployment Rate for District in Quarter	1.409
2) Percent of District's Male 17-21 Population that is Black	.057
3) Average Size of Labor Force in District for that Quarter	.11
4) Urban-Rural Mix (Percent of Male 17-21 Year Old Population in SMSA)	-.0818
5) Dollars of Local Advertising (Impacting District in Quarter)	.889 (significant at the 10% level)

*The Park's regression package which automatically adjusts for unequal variances of the error term and autocorrelation residuals was utilized.

of LAMS expenditures. When overhead costs are added (@ 38%), we find an average cost per Local Lead in FY80 of \$30 (compared to NOIC - Navy source leads of about \$80). The elasticity of LAMS dollars on Local Leads, yields a marginal cost per HSG contract (from LAMS expenditures) of about \$1,600 in LAMS placement cost and \$2,200 if the 38% overhead is added in (see Section 5).

4.0 ANALYSIS OF NOIC LEADS

An NOIC Lead is any lead that goes through the Navy's national clearing-house mechanism and results from a toll-free call, or a direct mail response. It is closely tied to TV/Radio campaigns, magazine campaigns and direct mail campaigns. It can originate from Navy advertising or JADOR advertising.

The results of applying the Park's regression program to 2 years of monthly district data are shown in Table 2. The 2 years were FY79 and FY80. The key results¹ from using a log-log Koyck model with monthly dummies are as follows:

- i) There is a strong lagged effect of advertising resources on generating total NOIC Leads, i.e., NOIC - Navy and NOIC - JADOR. In particular, it takes 3.01 months for 95% of the total advertising impact on NOIC Leads to be realized. (These results are due to the fact that the autoregressive Koyck term, λ , in the regression analysis is about .37 and that $\frac{\ln .05}{\ln \lambda}$ is the time duration required for 95% of the effect to be felt.) This agrees with the Navy's Recruiting Command planning estimate for the lagged effects of advertising.
- ii) The most important demographics, affecting the yield on NOIC Leads, are:

¹The only data base available at a district, monthly level are for total NOIC Leads, i.e., the sum of those from both Navy sources as well as from JADOR sources. Hence the only dependent variable possible is total NOIC Leads. A new data base which partitions, by month by district, the NOIC Leads into NOIC - Navy and NOIC - JADOR is soon to be made available. This will allow us to investigate the relative merits of the two types of NOIC Leads.

TABLE 2

THE IMPACT OF VARIOUS ADVERTISING MEDIA EXPENDITURES AND DEMOGRAPHICS
ON TOTAL NOIC LEADS (i.e., Both Navy and JADOR Originated)

(based on pooled monthly-district observations for 24 months (FY79, FY80)
or 1,032 cells using the Park's regression model)

Variable	Estimate of Short Term Elasticity	Estimate of Long Term Elasticity
Total Number of NOIC Leads Obtained from District for given month (dependent variable)	--	--
<u>Demographics (Uncontrollable)</u>		
1) Percent of male 17-21 ad population that is black	.094	.149
2) Local General Unemploy- ment rate	.152	.241
3) Size of Labor Force	.077	.122
4) Number of male High School seniors in district	.403	.640
5) Percent of district's male (17-21) population located in a SMSA (urban-rural max)	.115	.183
6) Navy Propensity (based on responses to questionnaire and a proxy for tradition, proximity to Navy bases, edu- cation, income, etc.)	.325	.516
<u>Resources (Controllable)</u>		
1) TV/Radio Expenditures* (GEP -General)	.0153	.0243
2) Magazine Expenditures* (GEP**-General)	.053	.0841
3) Direct Mail Expenditures (GEP**-General)	.110	.1746
4) Minority Advertising Expen- ditures (GEP - Minority)	Insignificant	-
5) JADOR TV/Radio	-.006	-.009
6) JADOR Magazines	.026	.0413
7) JADOR Direct Mail	-.022	-.0349

* All advertising expenditures were adjusted to reflect a constant
purchasing power over the 24 month period.

** General Enlisted Program

- a) Size of male High School senior population at an elasticity of .64;
 - b) the local general unemployment rate at an elasticity of .241;
 - c) Military propensity at .516;
 - d) the urban-rural mix and the percent black are also somewhat factors at .183 and .149 respectively.
- iii) The advertising impacts of various Navy - General media types on NOIC Leads are all significant with Navy's direct mail the clear winner with an elasticity of .1746. This implies that every 10% increase in GEP - General's direct mail campaign would yield another 1.746% in NOIC Leads. In FY80, there were a total of 69,709 NOIC - Navy source leads with Navy's GEP - General direct mail placement cost of \$.431 Million. This implies at the margin that in FY80 an additional NOIC - Navy Lead could have been obtained for every additional \$35.40 in direct mail expenditure for placement costs. One needs to add to this about 26% in overhead yielding about \$44.60 for each additional NOIC - Navy Lead if the additional funds are put into Navy's direct mail. This is to be compared to the overall average of \$80 per NOIC - Navy Lead for FY80.

In order to put these numbers in perspective, it is important to appreciate (see Table 3) that the elasticity of NOIC Leads on HSG Contracts is .0516, thereby yielding an elasticity for direct mail expenditures on HSG Contracts of .009 (i.e., $.009 = .0516 \times .1746$). This yields the result that in FY80 each additional HSG Contract from additional Navy direct mail expenditures would have cost about \$960 (with overhead). This equates to a yield rate of NOIC Leads to HSG Contracts of about 2.3%, somewhat less than the 3.7% rate empirically observed for all types of contracts.

- iv) The second biggest impact on NOIC Leads is due to Navy GEP-General Magazine advertising at an elasticity of .0841. This is based on data for FY79 and FY80. Ironically, in FY80 the magazine advertising level was only \$37,500. This is to be compared with \$3.38M for Navy TV and Radio and \$2.167M for JADOR - Magazines. The very small level of Navy magazine advertising in FY80 renders it impossible to estimate a credible marginal cost for NOIC Leads from additional Navy magazine advertising expenditures.
- v) There is a positive impact of advertising on total NOIC Leads from Joint DOD (JADOR) magazine campaigns with an elasticity of .0431.

It will also be shown subsequently that JADOR magazine and probably Navy* advertising appear to affect the production of HSG Contracts, over and above its impact on NOIC Leads. Perhaps the brighter, action-oriented potential recruits see a magazine ad and are motivated to visit their local recruiting office directly. These types of leads will be referred to as "walk-in's."

- vi) Finally, the Navy's GEP - General TV/Radio has a positive effect on NOIC Leads, with an elasticity of .0243. However, when one takes into account the Navy's GEP - General TV/Radio budget at about \$3.388 Million in FY80, the cost of generating additional NOIC - Navy Leads from additional Navy national TV/Radio only appears to be prohibitive.

* We used the word "probably" since the level of Navy magazine advertising was so very small in 1980 that it cannot be ascertained econometrically using only FY80 data. Unfortunately FY80 data is the only one for which we have Local Lead data so resolving of this conjective will take place when FY81 data becomes available.

- vii) The GEP - Minority advertising expenditures do not appear to have any positive impact on the production of NOIC Leads or on HSG Contracts. A total of \$562,000 was spent on this mechanism in FY80.
- viii) Both JADOR TV/Radio and JADOR Direct Mail appear to actually have a small negative impact on NOIC Leads, perhaps since on a net basis they may take away more NOIC Leads than they deliver, i.e., it appears the JADOR - Direct Mail or JADOR TV/Radio may possibly hurt the production of NOIC Leads, relative to the Army's "React" Leads or Air Force Leads.

5.0 ANALYSIS OF PRODUCTION OF HSG ENLISTMENT CONTRACTS

5.1 Structure of Model

An analysis was performed of the impacts of demographics, recruiters, various types of leads, and advertising on male, non-prior service HSG Contracts, and Upper Mental, HSDG Contracts, both of these being "bottom-line" measures. The focus is on these types of contracts since they represent the supply limited group for which regression analysis is most appropriate.

Table 3 describes the results of a log-log regression model (yielding a multiplicative Cobb-Douglas type production function) using monthly-district data for FY80 only, the only year for which Local Leads were available. The model had an interesting structure designed to test if there was a discernible impact of the various advertising media on the various types of High School Contracts, over and above their impact through Leads. Hence, one is attempting to capture what is referred to in recruiting circles as the "walk-in's": namely, those individuals who see some type of national advertising, by pass the NOIC channels, pay a visit to their local recruiting

office and subsequently enlist. It is felt High School recruits may be more prone to do this since they may tend to be more action-oriented than the other group.

The model use included monthly dummy variables to capture the seasonal nature of recruiting. In trying to forecast the levels of High School Contracts obtained in a given district in month j ($j = 1, 2, \dots, 12$) it utilized:

- i) the level of total NOIC Leads obtained in the district in month $j-2$;
- ii) the level of Local Leads obtained in the district in month $j-1$;
- iii) the separate levels of advertising in Navy's TV/Radio, magazines, direct mail, and JADOR's TV/Radio, magazines and direct mail in month $j-1$;
- iv) the level of recruiters in month j ;
- v) the level of key demographics in month j , i.e., the local unemployment rate, pay ratio, number of High School seniors, etc.

The two month lag for NOIC Leads and the 1 month lag for Local Leads and the Advertising lags was arrived at by varying the lag structure in several regression runs and utilizing those with the largest R^2 's. By lagging the NOIC Leads by 2 months and the Advertising by 1 month, one does not introduce collinearity between the advertising variables and NOIC Leads. The one month lag on the walk-in's impact for HSG Contracts is to allow some time lag for testing and decision making by the potential recruit.

5.2 Results for HSG Contracts

5.2.1 Impact of NOIC Leads

The results (see Table 3) appear very intuitive and agree with other previous findings of this Investigator. Note the elasticity of .051 for NOIC Leads on HSG Contracts. That is, a 10% increase in NOIC Leads would produce a half of one percent increase in HSG Contracts. Given the 144,477

TABLE 3

THE IMPACTS OF VARIOUS TYPES OF LEADS, ADVERTISING EXPENDITURES, RECRUITERS
AND DEMOGRAPHICS OF HIGH SCHOOL GRADUATE (HSG) CONTRACTS
(Based on pooled monthly-district regression for FY80, using the Park's
Regression Model)

	<u>Estimate of Elasticity</u>	<u>t value</u>
A) Number of male, non-prior service HSG Contracts obtained from dis- trict in month j (dependent variable)	--	--
<u>Demographics</u>		
1. Number of male High School seniors in district in month j	.522	4.35(significant at the .001 level)
2. Ratio of first year's military pay to civilian pay in district for month j	.64	2.28 (significant at the .01 level)
3. Military propensity in district in month j	.211	1.66 (significant at the .09 level)
4. Local general unemployment rate in district in month j	.111	1.31 (significant at the .10 level)
5. Percent of district's male 17-21 population that is in a SMSA (urban-rural mix)	.023	.28. (not significant at the .10 level)
6. Size of labor force	.10	Significant at the .10 level
<u>Leads</u>		
7. Number of NOIC leads obtained in dis- trict two months earlier, i.e., in month j-2	.0515	2.12 (significant at the .02 level)
8. Number of Local Leads obtained in district one month earlier (i.e., in month j-1)	.0133	1.7 (significant at the .06 level)
<u>Resources Expended</u>		
9. Number of production recruiters in district in month j	.33	3.25 (significant at the .001 level)
10. Navy Direct Mail expenditures in month j-1 (GEP - **General)	Insignificant	--
11. TV/radio expenditures in month j-1 (GEP - General)	Insignificant	--
12. Magazine expenditures in month j-1 (GEP - General)	Insignificant	--
13. JADOR - Direct Mail advertising in month j-1	Positive but Insignificant	--
14. JADOR TV/radio in month j-1	Positive but Insignificant	--
15. JADOR - Magazines	.033	2.25 (significant at the .008 level)

NOIC Leads obtained in FY80 as well as 63,929 HSG Contracts, this implies that, at the margin, 43.88 additional NOIC Leads would have been needed in FY80 to produce one additional HSG Contract for a yield rate (for HSG Contracts) of about 2.3%. We note this is different from a conversion rate since not all of the NOIC Leads are HSG qualified.

5.2.2 Impact of Local Leads

Next consider the elasticity for Local Leads on HSG Contracts estimated for the first time, since FY80 was the first year such data was collected. This elasticity is .0133. Since 55,645 Local Leads were reported in FY80, this implies that about 65.44 additional Local Leads would have been needed then to yield one additional HSG Contract in FY80. This is a yield rate (for HSG Contracts) of about 1.53%. Recall also that the average cost of a Local Lead (from LAMS) was about \$30 (with overhead) and that the average cost for a NOIC - Navy Lead (with overhead) was about \$80. Hence, given the yield rate of NOIC Leads at 2.3%, the Local Leads appear to be more cost-effective on average.

5.2.3 Impact of Recruiters

The elasticity for production recruiters on HSG Contracts is .33^{*} implying that a 10% increase in recruiters would be accompanied by a 3.3% increase in HSG Contracts. This implies that each additional HSG Contract from additional recruiter efforts in 1980 would have required about .17 of an additional recruiter man year. Conversely an additional recruiter could have been expected to produce at the margin, about 5.6 additional HSG Contracts. This is to be contrasted with the average of nearly 17 HSG Contracts

*The corresponding elasticity for recruiters on Upper Mental HSDG Contracts is somewhat higher. Apparently recruiters are significantly more important to the bright recruits with a bona-fide High School Diploma than is the case for GED's or Lower Mental HSDG Contracts.

obtained per recruiter, the large difference perhaps being due to the diminishing return nature of recruiter resources (due to the shrinking of the eligible pool of recruits). If one uses the \$26,000 to \$33,000 range for a recruiter man-year, this additional cost becomes \$4,420 to \$5,600 per additional HSG Contract if all the additional resources are put into only recruiters. It should be mentioned that this recruiter elasticity is substantially less than the one obtained from the FY76-78 period which did not include Local Leads, the disaggregated JADOR advertising nor the effect of walk-in's. The presence of the above factors may explain some of the reduction. Other possible explanations are that, with only one year of data, there is not enough variation in the number of recruiters for the model to properly estimate the elasticity. Recall that we do use a pooled cross-sectional model so that we include the cross-sectional variation. This issue will become resolved when the two years of data (with Local Leads) become available.

5.2.4 Direct Impact of Advertising on HSG Contracts Over and Above Impact on Leads: Impact of Advertising on "Walk-In's"

The model shows that JADOR Magazine advertising and possibly GEP-General Magazine advertising generate "walk-in's," some of which convert to HSG Contracts. The elasticity for the one month lagged impact of JADOR Magazine advertising on HSG Contracts is .033, and is very significant. The elasticity estimate for GEP - General Magazine is positive but not statistically significant, no doubt due to the very small level of magazine advertising in FY80. No similar impact of TV/Radio, or direct mail on walk-in's could be identified.

5.2.5 Impacts of Demographics

The model yields intuitive results for the four demographic variables which turn out to be statistically significant. They are: the number of

male High School seniors at .522; ratio of military pay to civilian pay at .64; the local general unemployment rate at .111; and propensity (a proxy for military tradition, proximity to military bases, etc.) at .211. The urban-rural factor has a small impact (at .023) with the percent black apparently not affecting significantly the number of HSG Contracts obtained. As before the elasticity for unemployment is most likely underestimated due to little variation in the independent variable over only one year.

6.0 SUMMARY OF MARGINAL COST-EFFECTIVENESS OF VARIOUS RESOURCES ON HSG CONTRACTS IN FY80.

Table 4 is presented which combines the impacts of Table 1, Table 2 and Table 3 to yield the net impacts of various demographics and resources on HSG Contracts. These results are obtained by substituting the equations for Local Leads and NOIC Leads into the equation of Table 3 and collecting terms.

To summarize, the marginal cost-effectiveness of adding resources in FY80, in terms of increasing the yield of male, non-prior service HSG Contracts is as follows:

- 1) Navy - General Magazines would have been the very clear winner (probably due to the extremely low expenditures in FY80). This is true regardless of whether or not the "walk-in" effect is included or not.
- 2) Navy GEP - General Direct Mail was second.
- 3) JADOR - Magazines
- 4) Local advertising was fourth.
- 5) Recruiters.

The others appear not to be really viable options, by themselves, for increasing at the margin the number of HSG Contract.

TABLE 4
THE AGGREGATED IMPACTS OF DIFFERENT DEMOGRAPHICS AND RESOURCES ON
HIGH SCHOOL CONTRACTS
(Based on combination of FY79 and FY80 results)

<u>Variable</u>	<u>Sources of Impact</u>	<u>Long Term Elasticity</u>
8) Number of male, non-prior service HSG contracts obtained from district (dependent variable)	--	--
<u>Demographics</u>		
1. Number of male High School Seniors in district	Impacts yield of NOIC Leads and also directly on HSG Contracts	.53
2. Ratio of military pay to civilian pay in district	Directly on HSG Contracts	.64
3. Propensity in district	Impacts yield of NOIC Leads and also directly on HSG contracts	.2224
4. Local general unemployment rate in district	Impacts yield of Local Leads, NOIC Leads and also-directly on HSG Contracts	.141
5. Urban-Rural mix	Impacts yield of Local Leads, NOIC Leads and also directly on HSG Contracts	.043
6. Labor force in district	Impacts yield of Local Leads & NOIC Leads	.107
7. Percent of district's male 17-21 year old population that is black	Impacts yield of Local Leads and NOIC Leads	.0084
<u>Resources</u>		
8. Recruiters	Impacts directly on HSG Contracts	.33
9. Local advertising (LAMS)	Impacts Local Leads only	.0118
10. Navy's TV/Radio (GEP - General) expenditures	Impacts on NOIC Leads	.0013
11. Navy's Magazine (GEP - General) expenditures	Impacts on NOIC Leads and probably on walk-ins	.0043
12. Navy's Direct Mail (GEP - General)	Impacts on NOIC Leads	.0090
13. GEP - Minority	No discernible positive impact on HSG Contracts	0
14. Joint DOD TV/Radio advertising	Impacts on NOIC Leads	-.0005
15. Joint DOD Direct Mail	Impacts on NOIC Leads	-.0018
16. Joint DOD Magazine	Impacts on NOIC Leads and on "Walk-ins"	.035

* Includes the total impact of different resources and demographics through the various lead mechanisms as well as their impacts directly on contracts.

7.0 COMPARISON OF RELATIVE IMPORTANCES OF VARIOUS TYPES OF LEADS, ADVERTISING EXPENDITURES, RECRUITERS, AND DEMOGRAPHICS ON TWO TYPES OF QUALITY CONTRACTS

The basic data that has been available over the past several years has been on male, non-prior service HSG Contracts. Indeed the primary validation efforts of this investigator have focused on applying a predictive equation, for male, non-prior HSG recruits, built using data from the years 76-78, to the years FY79 and FY80. In both cases the prediction was within 2-3% of the actual totals. However, the real planning parameters of the Recruiting Command center around the so-called A or α cell, i.e., the numbers of Upper Mental, HSDG Contracts obtained. Recall that in FY80 that the relative numbers of contracts were 63,929 HSG Contracts but only 38,680 were Upper Mental, HSDG Contracts.

The main differences, based on some preliminary regression runs on the Upper Mental, HSDG Contracts, appear to be the increased role of recruiters for the signing of Upper Mental HSDG Contracts and much less reliance on the formal lead generation process (both NOIC Leads and Local Leads). Hence advertising plays a less important role. In addition, the level of military pay seems to be less important to the Upper Mental, HSDG recruit than for the lower quality recruit.

TABLE 5

COMPARISON OF THE DIFFERENT IMPACTS OF VARIOUS TYPES OF LEADS, ADVERTISING
EXPENDITURES, RECRUITERS AND DEMOGRAPHICS ON HSG AND UPPER MENTAL HSDG CONTRACTS

(Based on pooled monthly-district regression for FY80, using the Park's
Regression Model)

	<u>Elasticity for HSG Contracts</u>	<u>Elasticity for Upper Mental HSDG Contracts</u>
<u>Demographics</u>		
1. Number of Male High School Seniors in District in Month j	.522*	-
2. Number of Male, Upper Mental, High School Seniors in District in Month j	-	.406*
3. Ratio of First Year's Military Pay to Civilian Pay in District for Month j	.64*	.546*
4. Military Propensity in District in Month j	.211	.39*
5. Local General Unemployment Rate in District in Month j	.111	.13*
6. Percent of District's Male 17-21 Population that is in a SMSA (Urban-Rural Mix)	.023	.072
<u>Leads</u>		
7. Number of NOIC Leads Obtained in District Two Months Earlier, i.e., in Month j-2	.052*	.013
8. Number of Local Leads Obtained in District One Month Earlier, i.e., in Month j-1	.0133	.011*
9. Number of Production Recruiters in District in Month j	.33*	.38*
10. Direct Mail Expenditures in Month j-1 (GEP-- General)	Negative but Insignificant	Insignificant
11. TV/Radio Expenditures in Month j-1 (GEP-General)	Negative but Insignificant	Positive but Insignificant
12. Magazine Expenditures in Month j-1**	Insignificant	Positive but Insignificant
13. Joint DOD Magazine Advertising in Month j-1 (JADOR)	.033*	Insignificant
14. Joint TV/Radio Advertising in Month j-1**	.014	Positive but Insignificant
15. Joint Direct Mail Advertising in Month j-1	.039	Positive but Insignificant

* Statistically significant at the 10% level.

** The impact estimated here is only for the media's effect on walk-in leads and subsequent contracts. It's additional impact on NOIC Leads is obtained by combining results of Table 2 with the elasticity in item 7.

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ONR-200-7	2. GOVT ACCESSION NO. AD-A122	3. RECIPIENT'S CATALOG NUMBER 371
4. TITLE (and Subtitle) COMPARISON OF THE MARGINAL COST-EFFECTIVENESS OF VARIOUS RECRUITING RESOURCES FOR HIGH SCHOOL GRADU- ATE ENLISTMENTS: Analyses of National, Local and "Walk-In" Leads and Yield Rates		5. TYPE OF REPORT & PERIOD COVERED
7. AUTHOR(s) Richard C. Morey		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Center for Applied Business Research Fuqua School of Business Duke University, Durham, NC 27706		8. CONTRACT OR GRANT NUMBER(s) N00014-30-C-0200
11. CONTROLLING OFFICE NAME AND ADDRESS Office of Naval Research, Code 452 800 N. Quincy St. Arlington, VA 22217		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS NR170-903, 62763N RF 55521002
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE November, 1982
		13. NUMBER OF PAGES
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Distribution of this document is unlimited. Reproduction in whole or in part is permitted for any purpose of the U.S. Government		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Supported by the Naval Research Manpower R&D Program		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Cost effectiveness, advertising, regression, enlistments, Leads, yield rates, Joint DOD Advertising, non-prior service, male, contracts		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This research utilizes a 3 equation regression system using FY79 and FY80 data from the Navy Recruiting efforts. It estimates the marginal cost-effectives of various types of advertising media, both Navy's and the Joint DOD campaigns. It also estimates, in terms of quality contracts, the yield rates for national leads and for local leads; it also compares the impacts of various resources on male, non-prior service, Upper Mental, High School Degree enlist- ments compared to male, non-prior service High School Graduate enlistment contracts.		

1-83

DTIC